REMARKS

Applicant hereby responds to the Office Action of November 24, 2006, in the above-referenced patent application. Before this reply Claims 1-27 were pending in the application. Through this reply, new Claim 28 has been added. As such, Claims 1-28 are pending in the application.

Claims 7-10 and 21-24 were objected to as being dependent on a rejected base claim, but were deemed allowable if rewritten in independent form, including limitations of base claims and any intervening claims. Applicant wishes to thank the Examiner for detailing the allowable claims.

Claims 1-4, 11, 14, 15, 17-19, 25-27 have been amended to further clarify the claimed limitations. New dependent claim 28 has been added.

Objections

The specification, page 12, line 9, and page 22, line 22, were objected to. The specification has been amended to overcome the objections.

Claims 11 and 12 were objected due to certain informalities involving the phrase "difference signal". Claim 11 has been amended to overcome the objection to claims 11 and 12.

Claims rejections under 35 USC 112

Claims 14 and 27 were rejected under 35 USC 112, first paragraph, for the use of the phrase "variance value". Claims 14 and 27 have been amended to use the term "mean value", instead, and overcome the rejections under 35 USC 112, first paragraph.

Claims 3-10 and 17-26 were rejected under 35 USC 112, second paragraph, due to insufficient antecedent basis for certain limitations. Claims 3, 17 and 19 have been amended to overcome the rejections under 35 USC 112, second paragraph. Regarding Claim 25, please note that Claim 15 provides the "original image signal", and claims 25-26 have been accordingly amended to overcome the rejections under 35 USC 112, second paragraph.

Claims Rejections under 35 USC 102(e) and 103(a)

A. Claims 1-4 and 15-18 were rejected under 35 USC 102(e) as being anticipated by Nagao (USPN 6,628,842). The rejections are respectfully traverse since for at least the following reasons Nagao does not disclose all of the claimed limitations, as amended.

As per Claim 1, Nagao does not disclose detecting image pixels that belong to a luminance transition range of an image edge, as claimed. Further, it is respectfully submitted that in Nagao, expansion of density's dynamic range (col. 16, lines 23-31, relied on by the Examiner) does not teach luminance transition range of pixels, as claimed. Rather, it is respectfully submitted that this is an interpretation by the Examiner without support in the reference. Notably, Nagao does not even mention a luminance

transition range or a luminance transition range for an image edge, which is a spatial attribute of the image edge (e.g., a luminance transition range has a length).

Further, Nagao does not disclose generating gain suppression factors for the detected pixels in the luminance transition range of the image edge, as claimed. In addition, Nagao does not disclose performing image detail enhancement on the image pixels while selectively reducing enhancement of the detected image pixels in the luminance transition range relative to enhancement of other image pixels based on the gain suppression factors, as claimed.

Nagao is oblivious to generating gain suppression factors, and specially gain suppression factors for pixels in luminance transition range of an edge. Nor does Nagao mention selective reduction of enhancement for pixels in the luminance transition range of an edge, relative to other image pixels, as claimed. And, Nagao does not teach that such selective reduction of enhancement for pixels in the luminance transition range of an edge is based on gain suppression factors generated for the pixels in the luminance transition range of an edge.

As per Claim 2, Nagao does not teach selecting enhancement gain factors for the image pixels, as claimed. Further, α in Nagao (relied on by the Examiner) is not an enhancement gain factor, rather a scaling factor. The scaling factor α in Nagao is not for enhancing the image pixels, rather the scaling factor α in Nagao is for scaling the blur retaining but sharpness enhancing component $\Delta I_{BS}(x,y)$.

In addition, Nagao does not teach combining the gain suppression factors with the corresponding enhancement gain factors to obtain adjusted gain factors, as claimed. As discussed, the scaling factor α in Nagao is for scaling the blur retaining but sharpness enhancing component $\Delta I_{BS}(x,y)$ only. To obtain $\Delta I_{BS}(x,y)$ in Nagao, the original image data $I_I(x,y)$ is subtracted from the sharpness enhanced image data $I_S(x,y)$ to obtain the sharpness enhancing component, which is multiplied by the blur retaining but sharpness enhancing coefficient $C_{BS}(x,y)$, where $\Delta I_{BS}(x,y) = C_{BS}(x,y) \times (I_S(x,y) - I_I(x,y))$. As such, additionally Nagao does not disclose performing image detail enhancement on the image pixels based on the adjusted gain factors to selectively reduce enhancement of the detected image pixels in the luminance transition range of the edge, as claimed.

As per Claim 3, Nagao does not disclose a luminance transition range of the edge and a center pixel of the luminance transition range, as claimed. Nagao does not teach detecting a luminance transition range or center pixel in that luminance transition range. Further, as discussed, it is respectfully submitted that expansion of density's dynamic range in Nagao has nothing to do with luminance transition range of pixels, as claimed.

As per Claim 4, as discussed Nagao does not teach generating a gain suppression factor for each pixel within a luminance transition range of the edge. As a result, Nagao does not teach generating such a gain suppression factor based on the position of a pixel within the luminance transition range relative to the center pixel of the luminance transition range, as claimed.

In Nagao, b_0 is a blurred region sharpness enhancing coefficient for setting the degree of sharpness enhancement in the blurred region. The Examiner has interpreted b_0 in Nagao as an enhancement gain factor, and also interpreted α in Nagao as an enhancement gain factor, and also interpreted $C_{BS}(x,y)$ in Nagao as enhancement gain factor, and also interpreted $C_{BS}(x,y)$ in Nagao as gain suppression factor. It is respectfully submitted that these are inconsistent interpretations, and not supported by Nagao. Nagao does not teach generating such a gain suppression factor based on the enhancement gain factor for that pixel, as claimed.

Further, Nagao does not teach generating a gain suppression factor based on the luminance contrast across the image edge, as claimed. Nagao's Ev is a normalized edge intensity data. Nagao does not disclose that normalized edge intensity data is the same as the claimed luminance contrast across the edge, as the Examiner suggests. Rather, it is respectfully submitted that this is an interpretation by the Examiner without support in the reference. Notably, Nagao does not even mention the term luminance contrast.

Claims 15-18 were rejected for essentially the same reasons as Claims 1-4, respectively, and as such it is respectfully submitted that Claims 15-18 should be allowed for at least the reasons provided in relation for Claims 1-4.

B. Claims 5, 6, 19 and 20 were rejected under 35 USC 103(a) as being unpatentable over Nagao in view of USPN 5,471,987 to Nakazawa et al. ("Nakazawa"). The

rejections are respectfully traversed since for at least the following reasons the references, alone or in combination, does not disclose all of the claimed limitations.

As per Claim 5, as discussed Nagao does not teach all of the limitations of the base claim 3. As the Examiner also states, Nagao does not disclose that the step of generating the gain suppression factors further includes the steps of selecting the gain suppression factors such that detail enhancement at the center pixel location in the luminance transition range is suppressed more than neighboring pixels in the luminance transition range, wherein for pixel locations farther away from the center pixel location detail enhancement suppression is further reduced, as claimed. However, the Examiner interprets Nakazawa, col. 11, lines 43-52) to disclose such limitations. Applicant respectfully traverses.

In Col. 11, lines 43-52, Nakazawa states: "Incidentally, in the constitution of the present example, when obtaining unsharp mask signal Sus of each pixel point through processing for averaging signal values of images included in a predetermined mask region, there is conducted weighting corresponding to the absolute value of a difference of signals between a central pixel and a peripheral pixel both within the mask region, and the weighting for the signal value of the peripheral pixel having the greater absolute value of the difference of signals from the central pixel is made smaller."

It is respectfully submitted that Nakazawa does not teach that the mask region is a luminance transition range as the Examiner states. Rather, it is respectfully submitted

that this is an interpretation by the Examiner without support in the reference. Notably, Nakazawa does not even mention luminance, luminance transition or luminance transition range.

Further, Nakazawa purportedly conducts weighting corresponding to the absolute value of a difference of signals between a central pixel and a peripheral pixel both within the mask region. By contrast, the claimed limitations require selecting gain suppression factors such that detail enhancement at the center pixel location in the luminance transition range is suppressed more than neighboring pixels in the luminance transition range, wherein for pixel locations farther away from the center pixel location detail enhancement suppression is further reduced.

Further, there is no justification, advantage, or motivation provided in the references, for modifying Nagao with Nakazawa. It is well settled that in order for a modification or combination of the prior art to be valid, the prior art itself must suggest the modification or combination, "...invention cannot be found obvious unless there was some explicit teaching or suggestion in the art to motivate one of ordinary skill to combine elements so as to create the same invention." *Winner International Royalty Corp. v. Wang*, No. 96-2107, 48 USPQ.2d 1139, 1140 (D.C.D.C. 1998) (emphasis added). "The prior art must provide one of ordinary skill in the art the motivation to make the proposed molecular modifications needed to arrive at the claimed compound." *In re Jones*, 958 F.2d 347, 21 USPQ.2d 1941, 1944 (Fed. Cir. 1992) (emphasis added).

Neither reference teaches the claimed limitations, as such, the combination does not teach the claimed limitations. Neither reference teaches detecting or using a luminance transition range as claimed. One of ordinary skill in the art would not look to the references to combine them, and even if Nagao can be combined with Nakazawa as the Examiner suggests, the result would not teach or fairly suggest selecting the gain suppression factors such that detail enhancement at the center pixel location in the luminance transition range is suppressed more than neighboring pixels in the luminance transition range, wherein for pixel locations farther away from the center pixel location detail enhancement suppression is further reduced. For at least these reasons, it is respectfully submitted that rejection of Claim 5 should be withdrawn. Claim 19 was rejected for essentially the same reasons as Claim 5, and as such it is respectfully submitted that Claim 19 should be allowed for at least the reasons provided in relation for Claim 5.

As per Claim 6, as discussed the references do not teach all of the limitations of the base claim 5. Further, neither Nagao nor Nakazawa disclose that the gain suppression factors are selected to essentially eliminate detail enhancement suppression for pixels outside the detected luminance transition range. Nakazawa in col. 12, lines 12-21 (relied on by the Examiner), states: "When unsharp mask signal Sus is computed as shown above, even when a pixel having an extremely different signal level exists in the peripheral portion in the mask region, it is possible to deter that an average value is shifted being affected by the peripheral pixel. It is therefore possible to prevent that an average value is shifted being affected by the sharp change of signals in the mask region

and thereby the region which is preferred not to be compressed from the beginning is forced to be compressed. Thus, occurrence of an artifact can be prevented."

Nakazawa purportedly mentions preventing that an average value is shifted being affected by the sharp change of signals in the mask region and thereby the region which is preferred not to be compressed from the beginning is forced to be compressed. An artifact as referred to in Nakazawa is created due to blocking compression, and not the result of an edge. Nakazawa does not disclose a luminance transition range for an edge. Nakazawa in combination with Nagao does not teach selecting gain suppression factors to essentially eliminate detail enhancement suppression for pixels outside the detected luminance transition range, as claimed. Further, there is no advantage or motivation by the references to combine them as the Examiner suggests. For at least these reasons, it is respectfully submitted that rejection of Claim 6 should be withdrawn. Claim 19 was rejected for essentially the same reasons as Claim 6 and as such it is respectfully submitted that Claim 10 should be allowed for at least the reasons provided in relation for Claim 6.

C. Claims 11, 12, 25 and 26 were rejected under 35 USC 103(a) as being unpatentable over Nagao in view of Curry (EP 920,190 A2). The rejections are respectfully traversed since for at least the following reasons the references, alone or in combination, does not disclose all of the claimed limitations

As per Claim 11, Nagao does not teach determining the difference between the original image signal *f* and the unsharp signal f_1, as a different signal, wherein said difference signal represents image details, as claimed. The Examiner interprets $I_S(x,y)$ in Nagao as the claimed unsharp signal f_l. However, in Nagao $I_S(x,y)$ is a sharpness enhanced image data, wherein $I_S(x,y) = I_1(x,y) + \alpha[I_1(x,y) - \langle I_1(x,y)\rangle]$, and $\langle I_1(x,y)\rangle$ is the blurred image. Nagao does not teach $I_S(x,y)$ as the claimed unsharp signal f_l.

Nagao does not teach the limitation of "selectively boosting the difference signal such that enhancement of the difference signal at the detected pixel locations is reduced relative to enhancement of other image pixels based on the gain suppression factors", as claimed. This limitation is different from $\alpha\Delta I_{BS}(x,y)$ presented by the Examiner, since $\Delta I_{BS}(x,y)$ in Nagao is not a difference signal $f - f_l$, as claimed.

Further, in rejecting claim 11, the Examiner interprets α in Nagao as a gain suppression factor, and $C_{BS}(x,y)$ as enhancement gain factor. This is opposite of what the Examiner's interpretations (see e.g. rejection of Claim 4). Indeed Nagao does not teach a gain suppression factor.

In addition, the Examiner interprets $I_2(x,y)$ in Nagao to be the same as the claimed detail enhanced image signal *g* which is obtained by adding the boosted signal to the original signal *f*. However, $I_2(x,y)$ in Nagao is a noise removed signal, and further not a sum of the boosted signal and the original signal *f*.

Further Nagao does not disclose performing a low pass filter function on the image signal f to generate an unsharp image signal f_1, as claimed. The Examiner interprets Curry to disclose such a limitation. Applicant respectfully traverses.

The Examiner interprets I_{in} in Curry as the claimed original signal f and I_{mask} as the claimed unsharp image signal f_1. Applicant respectfully traverses. In paragraph 0001, Curry states that I_{mask} is the blurred image, and in paragraph 0006, Curry states that to carry out unsharp masking of digital images, a smoothing filter 21 feeds a blurred version (i.e., I_{mask}) of the original (i.e., I_{in}) to a low pass filter 22, that differentiates the blurred image by passing back/near black pixels while transforming all other pixels towards white. As such, Curry does not disclose that the original signal I_{in} is filtered by the low pass filter 22 to blurred version I_{mask}. Therefore, Curry does not disclose performing a low pass filter function on the original image signal f to generate an unsharp image signal f_1, as claimed.

Further, there is no advantage or motivation by the references to combine them as the Examiner suggests. For at least these reasons, it is respectfully submitted that rejection of Claim 11 should be withdrawn.

As per Claim 25 was rejected for essentially the same reasons as Claim 11 and as such it is respectfully submitted that Claim 25 should be allowed for at least the reasons provided in relation for Claim 11. Further, regarding Claim 12, the Examiner interprets $I_S(x,y)$ in Nagao to be the same as the claimed difference signal $(f - f_1)$. However,

Nagao states that $I_S(x,y) = I_1(x,y) + \alpha[I_1(x,y) - \langle I_1(x,y)\rangle]$, wherein the original image data $I_1(x,y)$ is added to the α scaled difference of the original image data $I_1(x,y)$ and the average of $I_1(x,y)$ (i.e., $\langle I_1(x,y)\rangle$). As such, $I_S(x,y)$ is clearly not the same as the claimed difference signal $(f - f_1)$.

As per Claim 12, Nagao does not disclose that the enhanced image signal g is related to the original image signal f as: $g = (f - f_1) * K * \alpha + f$, wherein $(f - f_1)$ is the difference signal, K is the enhancement gain factor for the pixel, and α is the gain suppression factor for the pixel, as claimed.

Nagao states that $C_{BS}(x,y)$ is a blur retaining but sharpness enhancing coefficient, and this conflicts with the Examiner's interpretation of $C_{BS}(x,y)$ as an enhancement gain factor K, as claimed. In addition, this interpretation by the Examiner conflicts with earlier interpretation of $C_{BS}(x,y)$ by the Examiner (see e.g. rejection of Claim 1) to be the claimed gain suppression factor for detected edge pixels, as claimed. Although, Nagao mentions an edge enhanced component $I_1(x,y) - \langle I_1(x,y)\rangle$, but that is different from the claimed difference signal $(f - f_1)$ which is the difference between the original signal f and the low pass filtered version f_l of the original signal.

Finally, Nagao does not teach a product $\alpha C_{BS}(I_1(x,y) - \langle I_1(x,y)\rangle)$ as the Examiner seems to suggest, and Nagao does not teach that $\alpha C_{BS}(I_1(x,y) - \langle I_1(x,y)\rangle)$ is the same ad the claimed product $(f - f_1) * K * \alpha$. Indeed, Nagao does not disclose enhanced image signal $g = (f - f_1) * K * \alpha + f$, as claimed. For at least these reasons, it is respectfully

submitted that rejection of Claim 12 should be withdrawn. Claim 26 was rejected for essentially the same reasons as Claim 12 and as such it is respectfully submitted that Claim 26 should be allowed for at least the reasons provided in relation for Claim 12.

D. Claims 13, 14 and 27 were rejected under 35 USC 103(a) as being unpatentable over Nagao in view of USPN 5,050,227 to Furusawa et al. ("Furusawa"). The rejections are respectfully traversed since for at least the following reasons the references, alone or in combination, does not disclose all of the claimed limitations

As per Claims 14 and 17, it is respectfully submitted that Nagao does not disclose detecting image pixels that belong to an image edge by defining a two-dimensional window of pixels in the digital image, determining a mean value for a plurality of pixels around a selected pixel inside said window. The Examiner refers to "Col. 40-56" in Nagao for such teachings, but Applicant cannot find the location in Nagao that the Examiner refers to. At any rate, the array of image pixels N_E x N_E in Nagao for standard deviation does not teach the claimed limitations.

Further, Nagao does not disclose the limitations: based on the mean value, determining if the selected pixel is in an edge region in the window, and if the selected pixel is in an edge region, then determining if the selected pixel is essentially a center pixel in a luminance transition range of a slant edge, and if the selected pixel is essentially a center pixel in a luminance transition range of a slant edge, then determining the length of the luminance transition range of the slant edge (Claims 14, 27). Nagao fails

to disclose the step of detecting image pixels that belong to an image edge, further includes the steps of detecting image pixels that belong to a slant image edge (Claim 13).

It is respectfully submitted that Furusawa (col. 5, lines 43-52 and col. 4, lines 64-66, relied on by the Examiner) also fails to disclose such limitations. Furusawa is directed to contour retouching. In col. 5, lines 43-52, Furusawa states: "The edge-detection filters are applied to the designated area R1 or R2 to detect a contour. Namely, the central pixel of the 3x3 matrix of each filter is sequentially placed at each pixel in the designated area, and the values of the image signal for the 3x3 matrix are weighted and added together. If the absolute value of the edge-detection data thus obtained is greater than a prescribed threshold value TH1, the central pixel is judged to be on a border (or a contour), that is, it is judged that the designated area includes a contour. Further, the direction of the contour is found to be one particular to the filter which gives the largest absolute value of the edge-detection data." It is respectfully submitted that in this passage (or elsewhere) Furusawa does not disclose: based on the mean value of pixels in a window, determining if the selected pixel is in an edge region in the window, and if the selected pixel is in an edge region, then determining if the selected pixel is essentially a center pixel in a luminance transition range of a slant edge, as claimed.

Further, in col. 4, lines 64-66, Furusawa states: "At a step S6, it is judged whether or not the designated area R1 or R2 includes a contour, and a direction in which the contour, if any, is extending is found." It is respectfully submitted that in this passage (or elsewhere) Furusawa does not disclose: if the selected pixel is essentially a center pixel in

a luminance transition range of a slant edge, then determining the length of the luminance transition range of the slant edge, as claimed.

Further, Nagao and Furusawa do not disclose generating a gain suppression for each pixel within the luminance transition range, based on the position of the pixel within the luminance transition range relative to the center pixel of the luminance transition range, and then performing image detail enhancement on the image pixels includes selectively adjusting enhancement of the detected image pixels relative to enhancement of other image pixels based on the gain suppression factors, such that the length of the luminance transition range is essentially maintained (Claims 14, 27).

Neither reference teaches the claimed limitations, as such, the combination does not teach the claimed limitations. Further, there is no justification, advantage, or motivation provided in the references, for modifying Nagao with Furusawa.

CONCLUSION

For these, and other, reasons, Applicants believe that the claims are in condition for allowance. Reconsideration, re-examination, and allowance of all claims are respectfully requested. If the Examiner feels that a telephone interview would be helpful to the further prosecution of this case, Applicants respectfully request that the undersigned attorney be contacted at the listed telephone number.

Please direct all correspondence to **Myers, Dawes Andras & Sherman, LLP**, 19900 MacArthur Blvd., 11th Floor, Irvine, California 92612.

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: MS Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on February 26, 2007.

By Sarah A. Nielsen

Sarah A. Nielsen
Signature

Respectfully submitted,

2/26/7
Kenneth L. Sherman (Date)
Registration No. 33,783
Myers Dawes Andras & Sherman, LLP
19900 MacArthur Blvd., 11th Floor
Irvine, CA 92612
(949) 223-9600
(949) 223-9610 – Fax
Customer No.: 23386

R:\M-Z\SAM2 - KLS - Samsung Information Systems America, Inc\SAM2.PAU.29\01-AMD.doc